## Design and Development of a Completely Automated Flow Calorimeter for Enthalpy Increment Measurements

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A new flow calorimeter has been developed for the direct measurement of enthalpy increments for liquids and gases over a temperature range of 200 - 500 K and pressures to 20 MPa. The measurement technique uses a matching heater principle utilizing electric heaters and Peltier modules for temperature control. The calorimeter uses a novel heat exchanger design. The fluid sample flows through tubing which is sandwiched between two disks. The tubing is formed into a planar spiral pattern and rests in a spiral groove cavity between the two disks. Both a heater and a cooling element are stacked underneath the disk assembly to regulate the path of heat flow. In practice, the cooling element is designed to remove energy at a constant rate, whereas the heater power is varied to maintain the outlet sample temperature at the reference temperature of 298.15 K. Flow and no-flow experiments are run sequentially with the objective to make corrections for small heat losses unnecessary. The new calorimeter is a completely automated apparatus controlled by a computer and is capable of running continuously to measure an entire pressure-enthalpy-temperature surface in 1-2 weeks.